Testing the Practicality of a Personal Digital Assistant Questionnaire versus a Beeper and Booklet Questionnaire in a Random-Time Experience-Sampling Method Context

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Abstract

The Random-Time Experience-Sampling (RTES) method has been used to examine people's subjective experience of time in particular activity contexts as they are experiencing particular events at random times throughout the day. The method involves a signalling device that cues respondents (at random intervals) to evaluate and report their activities for up to 70 moments of time during a week. While many empirical studies have used electronic pagers or 'beepers' to signal respondents, advances in information technologies have led to the increasing use of computerised platforms in Experience Sampling Method (ESM) research. This paper reports on a pilot study to examine respondent reactions and ability to complete a time use survey using two different reporting methods. Each respondent was asked to complete a time diary at random times of the day using: 1. a Personal Digital Assistant (PDA) (for three days); and 2. a Beeper and Booklet (B&B) (for four days). PDAs are handheld computers. The researchers loaded the PDAs with specialised survey software for participants to electronically report time use experiences in response to signals from the PDA. The B&B method required respondents to report their time use experiences in a survey booklet when signalled at random times by a purpose-built electronic beeper. Based on positive respondent feedback on the merits of the PDA platform and the ability to download responses directly from the PDAs, a full-scale RTES study of parents in dual-earner households will use this method to gather data about work-life tensions, leisure and wellbeing in future years.

Introduction

within the context of everyday life (Christensen et al., 2003). This method, first developed by Csikszentmihalyi in the 1970s, allows researchers to sample people's reactions to their use of time as they are experiencing particular events, rather than through recall afterwards (Larson and Csikszentmihalyi, 1983). Typically, respondents carry electronic pagers or personal data assistants (PDAs) with them, and are signaled at random intervals (usually 7–10 times a day), over the course of a week (Csikszentmihalyi and Larson, 1987). Each signal cues respondents to report and evaluate their activities (via a self-report questionnaire) indicating what they are doing, the social and physical contexts of their activity, and their psychological state. A key decision facing researchers when designing studies using the random time experience sampling method is the choice of platform to be used to signal respondents.

Much of the empirical research conducted in the 1980s and 1990s used 'beeper and booklet' or 'pen and pencil' platforms to gather data on time use patterns and experiences (Hormuth, 1986). When signalled, the respondent would complete a survey form – usually contained in a booklet – consisting of a series of closed and some open-ended questions indicating their current activity/activities, the physical and social context for their current activity/activities, and their psychological state. Recent advances in information technologies have increased the accessibility of ESM in social and behavioural research via the use of computerised platforms to gather data *in situ*. Computerised experience sampling usually involves the use of palm-top computers, known as Personal Data Assistants (PDAs), installed with specialised software that allows participants to electronically report behaviours and experiences in response to pre-programmed signals at different times of the day. Responses are entered directly onto the unit by respondents immediately after being signalled and are downloaded into a computer later and without data entry thus avoiding tedious and time-consuming data entry by keyboard (Barrett and Barrett, 2001; Christensen et al., 2003).

The ESM has been used extensively in studies of mental health (e.g. de Vries, 1992; Csikszentmihalyi and Larson, 1987); in research on experiences in work and leisure (e.g. Csikszentmihalyi and LeFevre, 1989); in studies of happiness (Schimmack and Diener, 2003; Schimmack, 2003), as well as in studies of time use with different population groups including adolescents (Larson, 1989; Larson and Csikszentmihalyi, 1978; Csikszentmihalyi, Larson, and Prescott, 1977) and older persons (Voelkel and Brown, 1989; Donath, Ironmonger and Aitken, 1995). The ESM has also been used to address a number of leisure-related issues including the meaning and quality of leisure experiences among adolescents (Kleiber, Caldwell and Shaw, 1993); the effects of exercise deprivation on persons committed to exercise (Gauvin and Szabo, 1992); attrition processes associated with adolescents

and Zuzanek, 1986); experiences associated with adventure activities (McIntyre, 1999); and time use and leisure occupations of young offenders (Farnworth, 2000). Recent advances in computer technology have increased the accessibility of ESM and have contributed to a resurgence in popularity of the research approach, including studies relating to the impacts of work and time pressure on wellbeing.¹

While ESM procedures have been used sparingly in Australian and New Zealand research², the ESM is currently being used in the 'Work/Life Tensions' project, a study funded by the Australian Research Council to investigate issues of work/life balance among parents in dual-earner households in Australia. The main aim of the 'Work/Life Tensions' project is to examine the hypothesis that wellbeing is positively related to reduced time pressure, greater use of leisure and control over time schedules. The study also seeks to investigate relationships between time use, life-course experience and measures of physical and mental health through being nested within the Australian Longitudinal Study on Women's Health (ALSWH).

While the ALSWH data set provides a rich source of quantitative data on women's time use and wellbeing across the life-course, such data are limited in their capacity to examine how women and men experience time within the context of households where both parents combine work with family responsibilities. These limitations are being addressed in the 'Work/Life Tensions' study which seeks to achieve a broad but detailed perspective on parents' experience of work-life tension in dual-earner families. The study commenced in 2003 and is due to be completed in 2006. It incorporates four phases of data collection: focus groups, the random time experience sampling method, structured interviews, and data linkage with the ALSWH data set. The sample for the ESM and interview phases of the study consists of 100 dual-earner couples who live with their children, with 50 couples being randomly selected from the 'young' (aged 26–31 in 2004) and 50 couples from the 'mid' (aged 34–59 in 2005) ALSWH cohorts.

This paper reports on a pilot study designed to test two different Random-Time Experience-Sampling Method (RTESM) platforms under consideration for use in the main 'Work/life Tensions' study. In the trial, the practicality of using a personal digital assistant (PDA) questionnaire versus a beeper and booklet (B&B) questionnaire was tested in a RTESM context to gather data on how working parents use and experience time.

¹ The ESM is being used in the '500 family study' currently being conducted by the Sloan Centre on Parents, Children and Work – where programmed wristwatches and ESM forms are being used to gather data from family members at random moments over seven days.

² Ironmonger and Donath (1995) used the RTESM to examine time use among older persons in Melbourne. McIntyre (1999) used the ESM to sample participant perceptions of adventure experiences while participating in black water rafting and horse riding in Waitomo, NZ. Farnworth (2000) used the ESM and interviews to study time use among 37 probationary young offenders in Melbourne.

A desk-top survey examining the relative merits of using random time beepers versus palm pilots was conducted in 2003 prior to commencing the pilot study and a summary of results is presented in Table 1.

Table 1. Benefits and constraints of random time beepers and Palm Pilots

Considerations	Random time beepers	Palm Pilot M500
Unit Cost	\$400	\$299
Accessory cost		Pendragon survey writing program – (US)\$199 plus (US)\$55 for each site license
Battery life	Long life 4.5V alkaline battery – \$15.70 per battery	Palm comes with cradle that can recharge batteries. Battery lasts 3 weeks without recharging
Type of signal	Alarm – audible signal and LED display	Alarm – audible signal, LED display and vibrate options
Programming of random times	Yes – in minute increments via beeper software (MS Dos based)	Yes – round to nearest 5 minutes (Via Datebook Palm Pilot Software – easy to use program)
Security	Respondent cannot access random times	Respondent cannot access random times (able to password protect and hide random times on Datebook)
Ability to turn off and on	Yes. Beepers have an awake/asleep switch	No
Structural issues	If battery becomes dislodged then all random times programmed on RTB will be lost	M500 has a glass screen. Need to protect if mailing PDA to respondent
Survey collection	When signaled, respondent fills out paper-based survey form contained in an A4 sized booklet	When signaled, respondent responds to survey form contained on PDA

In comparing the beepers with the PDAs, the two platforms were comparable in terms of costs when both unit and accessory costs were taken into account. The two platforms were also comparable in terms of battery life, options for programming random time signals and security. The beeper had the advantage of an on/off switch which the PDA did not, while the PDA had a vibrate signalling option which the beeper did not. Since the platforms were going to be mailed to respondents who would collect them from their local post office, there were concerns that battery dislodgment and subsequent loss of data could be an issue with the beepers, while the glass screen on the PDA was a concern which we assumed could be addressed with appropriate packaging while in transit. There was also the possibility of loss of battery life if there was some delay in participants picking them up from the post office.

However, the key difference between the two platforms was the method of data collection. Based on reports of previous studies we were confident that the 'pen and paper' method with the beeper was a tried and tested option for gathering survey information. We were less certain about the capacity of respondents to input

information into a PDA without any previous experience, and therefore set out to field-test the two platforms with a sample of respondents of similar age to the two cohorts chosen for the main 'Work/Life Tensions' study. In this trial we wanted to find out if the computerised platform would yield better response rates when compared with the beeper and booklet method, as well as ascertain which platform respondents would prefer to use and why.

Method

A convenience sample of seven 'young' and nine 'mid-aged' women was recruited from persons associated with the Australian Longitudinal Study on Women's Health (ALSWH).³ Each respondent was asked to complete a time diary at random times of the day using (1) a personal digital assistant (PDA) (for three days) and (2) a beeper and booklet (B&B) (for four days – including a practice day). None of the participants had previously used a PDA.

In contrast to *interval-contingent sampling* (which refers to the type of data collection in which participants complete self-reports after a designated interval for a pre-set amount of time) and *event contingent sampling* (which occurs when participants complete self-reports when a pre-designated event occurs), a *signal-contingent procedure* was used, in which people responded to a signal at random times during the day. Having a participant respond to a random schedule of times avoids any expectancy effects that may come from having prior knowledge of the sampling times.

The PDAs and the beepers were programmed to randomly signal (i.e. beep) ten times a day. Random times for each participant for one week were generated using customised software developed at the University of Melbourne (Ironmonger and Donath, 1995). At these random moments, a respondent was signalled to answer a short questionnaire, consisting of mostly closed questions, either on the PDA or in a booklet. When the beep sounded either from the PDA or the beeper, the respondent was asked to describe what they were doing (up to three simultaneous activities), where they were, who they were with and their mood at the time. The questionnaire also collected information about motivation, time pressure, task demands, support and sense of control in relation to each time use activity.

³ The Australian Longitudinal Study on Women's Health – widely known as Women's Health Australia – is a longitudinal population-based survey, which examines the health of over 40,000 Australian women over a 20-year period. It was first funded in 1995. The project was designed to explore factors that influence health among women who are broadly representative of the entire Australian population. The study goes beyond a narrow perspective that equates women's health with reproductive and sexual health, and takes a comprehensive view of all aspects of health throughout women's life-spans.

In this trial participants were provided with a PDA (Palm Pilot M500) that signalled them to respond to a random beep (including an audible signal, vibration and flashing light) and complete a questionnaire electronically on the PDA. The random beeps, generated using a customised computer program, were programmed into the Datebook daily planner program on the PDA and hidden using a password so that respondents could not view the times of the random beeps. Pendragon Forms 4.0 survey software was used to create a customised electronic questionnaire that was used to collect and store participant responses in the PDA. The PDA stored participant responses until they could be downloaded onto a computer.

The Beeper and Booklet method required respondents to report their time use experiences in a survey booklet when randomly signalled by a purpose-built electronic pocket sized programmable beeper. These purpose-built beepers were custom designed and manufactured by the Computer Science Laboratory of the University of Melbourne in 1993.⁴ They were used for the first RTES study in Australia which examined how older households used and valued their time (Ironmonger and Donath, 1995; Donath et al., 1995). A list of random times specific for each participant was generated on a personal computer and then downloaded into the programmable beeper via an interface box. The beeper was set to beep continuously for thirty seconds. The beeper also had a flashing light, a button to end the current set of signals, a switch to make it silent and a clip to attach to clothing. The random times were loaded onto the beepers using a custom designed software program (Ironmonger and Donath, 1995). Having completed the pilot study, respondents were invited to provide feedback on their experience with both methods via an open-ended survey designed to gather information on both the ease of use and any difficulties associated with using either platform, as well as their preference in using the PDA or B&B if they had a choice. Respondents were also invited to attend a focus group to debrief on their experience as a participant in the pilot study. All sixteen of the respondents completed the survey with seven also participating in one of two focus groups.

Results

Response and non-response rates

Table 2 reports the numbers of responses for the beeper and booklet and the PDA methods for each participant. The response rate for PDA (66%) compared to the B&B (34%) clearly indicates that the PDA had much higher respondent compliance. Five out of sixteen participants failed to provide data using the B&B method, one participant did not provide data using the PDA method and one participant did not provide any valid data at all. The non-provision of data can be

⁴ The main component of this beeper device was a single chip microcomputer (Motorola 68705 CBS).

largely explained by equipment failure: one PDA malfunctioned and some beepers stopped working because of battery dislodgement. One respondent reported not having time to complete the pilot study, though provided feedback on the relative merits of both platforms.

Respondent preferences

Each of the participants in the pilot study completed a self-report survey where they were asked to comment on their experience of the two platforms in terms of ease of use, difficulties experienced in using either platform, the adequacy of user instructions, their preference for using either platform if given a choice, and reasons for preferring one platform over the other. Table 3 provides a summary of respondent feedback on each of these criteria, with comments from the participants from the young cohort noted in italics.

Table 2. Number of responses by RTES method

<i>Respondent</i>	<i>Beeper and booklet</i>	<i>PDA</i>
1	24	32
2	22	27
3	24	24
4	25	38
5	0	39
6	7	21
7	0	4
8	29	0
9	1	35
10	18	31
11	2	30
12	0	37
13	0	39
14	13	35
15	0	32
16	0	0
Total actual responses	165	424
Expected responses	480	640
Response rate	34.4%	66.3%

The respondents commented that the PDA was easy to use and was relatively quick with practice, indicating the importance of having detailed user guidelines and a practice day before commencing the main data collection period. Minor drawbacks included the alarm that was set too soft and the lack of a clip or carrier to facilitate portability. The screen display was also a problem for two of the respondents.⁵ In

⁵ Each of these issues has been addressed in the main study. The volume setting for signals has been set higher and a neck lanyard and pouch is provided with the PDA to facilitate ease of carrying. Ten

Table 3. Respondent feedback on relative merits of PDA & Beeper + booklet platforms

<i>Consideration</i>	<i>PDA</i>	<i>Beeper and booklet</i>
Ease of use	Quite simple to use Portable but needs a carrier More portable Less cumbersome Easy to use after 'getting the hang of it' Quicker with practice Relatively easy	Easy to use Clip allowed for easier carrying Very easy to use Clip allowed for easy carrying Could turn it off Quicker to complete diary
Difficulties	Alarm too soft – missed surveys Alarm didn't sound long enough Needed precision for accurate taping, selection and typing Small writing difficult to read Uncertainty about returning to a previous screen Too many alarms Screen quite dark Alarm too soft in noisy environment Needs a carrier Frustration with unfamiliar screens – difficulty returning to diary screen Battery ran out Didn't work Could (and did!) lose stylus Uncertainty about whether it was 'on'	Didn't work at all Had to remember to turn it on Booklet too bulky Alarm too soft in a noisy environment Faulty off switch caused problems Had to remember to turn it on
User instructions	Adequate No instructions for returning to a missed survey Needed a few more scenarios in the trouble shooting section Practice day was adequate and appreciated	Adequate
Preference post pilot	Easier and more convenient Portable and more reliable More reliable Less hassle to carry around More portable, reliable and practical Ease of carrying Ease of carrying, compact Less cumbersome, no need for accompanying booklet Beeper too inconvenient (didn't work) Convenience Portability and reliability Portable and more practical (beeper didn't work) Undecided – liked the fact that the palm pilot was always on.	Simplicity and ease of use Could fill out diary later The immediacy of completing, easier to carry around. Undecided – preferred the loud alarm and liked the booklet.

contrast, respondents reported that the beeper was also easy to use with the clip allowing for easy carrying, though the bulky A4 size booklet was seen to be a drawback for some. A booklet of B5 size or smaller would have been more

new PDAs with advanced screens with improved visibility were purchased for the main study.

satisfactory. Two of the respondents commented that the booklet was easier to use because it allowed them to fill out the diary later, a practice we were trying to avoid with the RTES method. While the ability to turn off the beeper at night was viewed positively by some, a couple of respondents forgot to turn the machine on the next day which led to missing reports. Mechanical failure was the major problem with the beeper, however, with six machines malfunctioning during the trial. In terms of user preferences we were encouraged that twelve of the sixteen participants preferred the PDA platform over the B&B, with three preferring the B&B and one undecided.

Summary and conclusions

Our pilot study supports previous reports' findings that computerised platforms yield better response rates compared to B&B measures and better ensure compliance with signal-contingent sampling procedures (Christensen et al., 2003; Scollon, Kim-Prieto and Diener, 2003).

It was estimated that the subjects in the trial each spent about ten to fifteen minutes a day completing the survey. The main effort, however, involved remembering to take the PDA or B&B with them at all times and tended to become more of a burden towards the end of the sampling period. The B&B proved to be more cumbersome to carry around and complete in comparison to the lightweight PDA. There were major difficulties with the beeper device as a result of battery dislodgement. The battery was not secured with a strong enough clip so that, in use, some batteries moved slightly from their electrical contacts. Without power, the beeper ceased to function. The respondents also reported that the questionnaire on the PDA interface was easily mastered and very convenient compared to the B&B Questionnaire. In total, the trial obtained a detailed insight about how a specific time use experience and various contextual variables varied during seven days in the lives of fifteen women.

Based on the findings of this pilot study, the computerised experience sampling platform (PDA Questionnaire) has several advantages over the beeper and paper approach (B&B Questionnaire). The PDA method required a lower effort per respondent, was easier to use and convenient to carry around all day in comparison to the B&B. Participants were able to record their responses to the time use questionnaire directly into the PDA unit. Participants responded directly on the PDA, negating the need to carry around a separate booklet. In addition to the convenience for the participant, the PDAs allowed data to be directly transferred to a personal computer for immediate analysis in various statistical and database software packages. Tedious and time-consuming data entry was avoided as responses could be downloaded directly into a computer without data entry. Human error in data entry was also avoided as data was directly transferred from the PDA to a computer. The avoidance of data entry and the decrease in the cost of these

electronic goods makes handheld PDAs cost-effective as well. The general qualitative feedback on the PDA questionnaire from respondents was positive. In contrast, technical problems were mostly related to battery life, and dislodgement with the beepers led to some frustration with several respondents.

Based on the positive respondent feedback on the merits of the PDA platform and the ability to download responses directly from the PDAs to a computer, a full-scale computerised RTES study of parents in dual-earner households is now being conducted. This will use the PDA platform to gather time use and time experience data as part of the 'Work/Life Tensions' study. By collecting time use data using the computerised RTES method (PDA Questionnaire) and wellbeing data already collected in the main ALSWH, the 'Work/Life Tensions' study will investigate the relationships between time use, life course experience and physical and mental wellbeing. By having a better understanding of the experience and impacts of work-life tension and the strategies for managing time in 'time-crunched' households, the full-scale study will contribute to national and international debates about the social and economic costs associated with time pressure and stress and their impact on wellbeing.

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References

- Barrett, L., & Barrett, D. (2001) An introduction to computerised experience sampling in psychology. *Social Science Computer Review*, 19(2), 175-85.
- Christensen, T., Barrett, L., Bliss-Moreau, E., Lebo, K., & Kaschub, C. (2003) A practical guide to experience-sampling procedures. *Journal of Happiness Studies*, 4, 53-78.
- Csikszentmihalyi, M., & Larson, R. (1987) Validity and reliability of the experience-sampling method. *Journal of Nervous and Mental Disease*, 175, 526-36.
- Csikszentmihalyi, M., Larson, R., & Prescott, S. (1977) The ecology of adolescent activity and experience. *Journal of Youth and Adolescence*, 6(3), 281-94.
- Csikszentmihalyi, M., & LeFevre, J. (1989) Optimal experience in work and leisure. *Journal of Personality and Social Psychology*, 56 (5), 815-22.
- de Vries, M. (ed.) (1992) *The Experience of Psychopathology: Investigating Mental Disorders in Their Natural Settings*. Cambridge, Cambridge University Press.
- Donath, S., Ironmonger, D.S., & Aitken, C.K. (1995) Random time sampling. *Australian Geographical Studies*, 32(2), 308-12.
- Farnworth, L. (2000) Time use and leisure occupations of young offenders. *American*

- Journal of Occupational Therapy*, 54(3), 315-25.
- Gauvin, L., & Szabo, A. (1992) Application of the Experience Sampling Method to the study of the effects of exercise withdrawal on well-being. *Journal of Sport and Exercise Psychology*, 14, 361-74.
- Hormuth, S. (1986) The random sampling of experiences in situ. *Journal of Personality*, 54, 262-93.
- Ironmonger, D., & Donath, S. (1995) *A Glimpse at Older Households: How Older Households Use and Value Time*. Households Research Unit, University of Melbourne, Melbourne.
- Kirschnit, C., Ham, M., & Richards, M. (1989) The sporting life: athletic activities during early adolescence. *Journal of Youth and Adolescence*, 18(6), 601-15.
- Kleiber, D., Caldwell, L., & Shaw, S. (1993) Leisure meanings in adolescence. *Loisir et Societe/Society and Leisure*, 16(1)9-114.
- Larson, R. (1989) Beeping children and adolescents: a method for studying time use and daily experience. *Journal of Youth and Adolescence*, 18(6), 511-30.
- Larson, R., & Csikszentmihalyi, M. (1978) Experiential correlates of time alone in adolescence. *Journal of Personality*, 46(4), 677-93.
- Larson, R., & Csikszentmihalyi, M. (1983) The experience sampling method. *New Directions for Methodology of Social and Behavioural Science*, 15(1), 41-56.
- Larson, R., Mannell, R., & Zuzanek, J. (1986) Daily well-being of older adults with friends and family. *Journal of Psychology and Ageing*, 1(2), 117-26.
- McIntyre, N. (1999) Investigating adventure experiences: an experiential sampling approach. *Scisco Conscientia*, 1(1): 1-13.
- Schimmack, U., & Diener, E. (2003) Experience sampling methodology in happiness research. *Journal of Happiness Studies*, 4(1), 1-4.
- Schimmack, U. (2003) Affect measurement in experience sampling research. *Journal of Happiness Studies*, 4(2), 79-106.
- Scollon, C.N., Kim-Prieto, C., & Diener, E. (2003) Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness Studies*, 4(1), 5-34.
- Voekel, J., & Brown, B. (1989) Experience sampling method in therapeutic recreation research. *Therapeutic Recreation Journal*, 23, 40, 35-46.